Tracking the Issue of Pharmaceuticals and Personal Care Products (PPCPs) in the Environment

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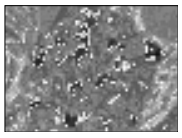
Emerging Substances of Concern

- Global Organic Contaminants
- Pharmaceuticals and Personal Care Products
- Endocrine Modulating Chemicals
- Nanoparticles
- Industrial Chemicals (new and recently recognized)

Pharmaceuticals and Personal Care Products (PPCPs)

- Includes prescription and over-the-counter (OTC) medications, cleaning agents, cosmetics, nutritional supplements, & skin care products
- Produced and used in larger volumes yearly
- Released via small quantity generators
- Biologically active
- Commercial labs cannot analyze



PPCPs in the Environment

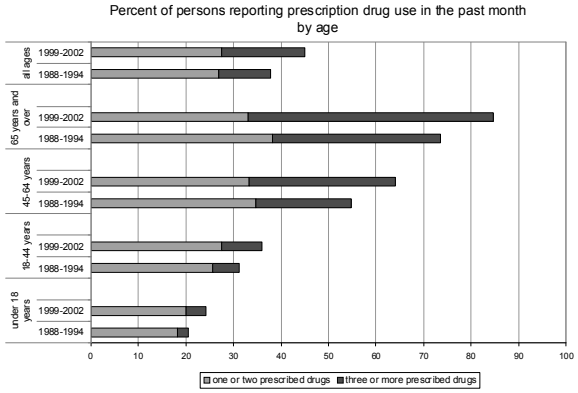
- DES has been tracking and assessing this issue for several years
- Recent headlines regarding pharmaceuticals in drinking water confirm the importance of our efforts and focus on this emerging issue

PPCPs – DES Program Interest

- Drinking Water
- Wastewater - Surface Water Discharges
- Wastewater - Groundwater Discharges
- Watershed Management – Ecological Impacts
- Residuals Management
- Solid Waste Management
- Air – Incineration of Solid Waste
- Household Hazardous Waste Management
- Hazardous Waste Management
- Environmental Health Program

NHDES Interests in PPCPs

- Assessing Occurrence (overcoming analytical lab issues)
- Fate & Transport
- Human Health/Ecological Health
- Source Characterization (individual use & disposal, vet/livestock, manufacturing)
- Treatment (wastewater/drinking water)
- Pollution Prevention (green chemistry, life cycle analysis, take back programs, public education, behavior modification)
- Risk Communication/Perspective
- Public Education
- Policy/Regulation (fed/state reg, policy, liability, nonreg)



Source: U.S. Center for Disease Control and Prevention. National Center for Health Statistics. National Health and Nutrition Examination Survey.

Medicine Use in NH

- **In 2006, fifteen millions prescriptions were filled in New Hampshire**
- **2 out of 3 people that visit a doctor leave with a prescription**

Source: New Hampshire Board of Pharmacy

Reducing pharmaceuticals in the environment would require changes in:

1) When and how medicine is prescribed and used;
2) How pharmaceuticals are designed and engineered so they do not persist once released in the environment;
3) Wastewater and drinking water treatment technologies; and
4) How unused medicines are disposed of.

Medicines in the Environment

Recent AP Study

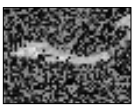
- 28 of 35 drinking water systems in the US had detectable levels of pharmaceuticals

U.S. Geological Survey Monitoring Study

- 139 streams analyzed in 30 states
- Contaminants identified in 80% of these streams
- 82 contaminants identified (many were pharmaceuticals)
- Co-occurrence common; average 7 distinct contaminants identified per stream

Kolpin, D.W. et al. 2002. "Pharmaceuticals, hormones, & other organic wastewater contaminants in U.S. streams, 1999-2000: A national reconnaissance." Environmental Science & Technology. 36(6):1202-1211.

Effects on Aquatic Organisms: Cause for Concern



- **Aquatic exposure – chemicals in the aquatic environment can result in continuous, multigeneration exposure.**
- **Feminization of fish - link to estrogen exposure?**

Ex: Boulder Creek, CO: female white suckers outnumber males by > 5 to 1; 50% of males have female sex tissue
(David Norris, Univ. of Colorado at Boulder)

- **Effects of antidepressants on fish and frog development?**

Ex: Lab studies show low levels of common anti-depressants, including Prozac, Zoloft, Paxil and Celexa, cause development problems in fish, and metamorphosis delays in frogs
(Marsha Black, Univ. of Georgia)

PPCP Studies in NH to Date

- Not aware of any published data
- USGS recently sampled 15 bedrock wells in the seacoast of NH
- EPA/DES has collected 14 river water and fish tissue samples (multiple locations on the Merrimack, Connecticut, Androscoggin and Contoocook Rivers)
- USGS plans to sample the Merrimack River just south of the state border
- UNH has historically applied for a grant to study PPCPs in Great Bay – not funded
- DES requiring groundwater discharge permitted sites to analyze for 1,4-dioxane
- DES/UNH continue to search for funding sources to conduct additional PPCP studies

AWWA Suggested Talking Points on PPCPs (slide 1 of 3)

- **The water community is committed to protecting public health. Water professionals are researching the occurrence of personal care products and pharmaceutical compounds in drinking water supplies and are paying close attention to health effects research in this area.**
- **Water professionals have the technology today to detect more substances – at lower levels – than ever before. As analytical methods improve, pharmaceutical compounds and personal care products are being found at very low levels in many of our nation's lakes, rivers and streams.**
- **The fact that a substance is detectable does not mean the substance is harmful to humans. To date, research throughout the world has not demonstrated an impact on human health from pharmaceuticals and endocrine disrupting compounds in drinking water.**

AWWA Suggested Talking Points on PPCPs (slide 2 of 3)

- **While these compounds may be detected at very low levels in source waters, people regularly consume or expose themselves to products containing these compounds in much higher concentrations through medicines, food and beverage and other sources. The level in which they are found in source waters is very small in comparison.**
- **The U.S. Environmental Protection Agency maintains an active program called the Contaminant Candidate List (CCL) to identify contaminants in public drinking water that warrant detailed study. The CCL does not currently include any personal care products or pharmaceuticals.**

AWWA Suggested Talking Points on PPCPs (slide 3 of 3)

- **While research has not demonstrated human health impacts from these compounds, the ongoing conversation should remind us of how precious our source waters are and the need to protect them from harmful substances. As a society, we should encourage policies that protect source water from contaminants introduced by pesticides, gasoline or industrial products. The best and most cost-effective way to ensure safe water at the tap is to keep our source waters clean.**
- **The federal Office of National Drug Control Policy recommends not flushing prescription drugs down the toilet unless the accompanying patient information specifically instructs it is safe to do so.**

NHDES Coordination with Other New England States, NY, EPA and USGS

- Conducted a 2-day conference in Portland, ME in August 2007 coordinated by NEIWPCC
  - Description of PPCPs of Concern
  - Detection in the environment and drinking water
  - Potential environmental and human health impacts
  - Fate and transport during drinking water and wastewater treatment processes
  - Unused medicine disposal practices
  - Green chemistry
- Presentations from the conference are available online at www.neiwpcc.org/ppcpconference/ppcpPresentations07.asp
- Attended 2007 &2008 Maine Benzodiazepine and Unused Drug Return Conference – see presentations at www.mainebenzo.org/2007conference.htm

Unused Medicine Disposal Options – Initiatives in NH

- DES is going to work with external stakeholders to address this issue – December meeting anticipated
- DES has developed an unused medicine disposal option assessment white paper
- HB 1681 (2006)- NH Board of Pharmacy is developing a pilot medicine redistribution program (contact: Paul Boisseau – Board of Pharmacy)

Assessment of Medicine Disposal Options White Paper Developed by DES

Summarizes

- Medicine use trends in the United States;
- Legal issues affecting how unused medicines may be collected and disposed;
- Potential health and environmental issues associated with releasing medicines to solid waste facilities and wastewater disposal systems;
- Typical unused residential medicine disposal and reuse practices in New Hampshire; and
- Options for managing unused medicines in New Hampshire.

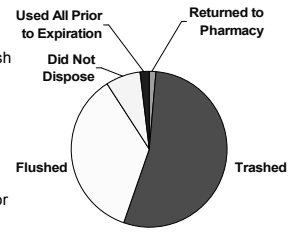
Estimated Sources of Unused Medicine in NH

- 66% of unused medicine comes from - residential users (35% of these medicines are disposed in wastewater system)
- 34% of unused medicine comes from health care facilities (100% are disposed in wastewater systems)

Expired Medication Disposal Habits

500 patients surveyed:

- **54%** disposed of medications in the trash
- **35.4%** flushed drugs down the toilet or sink
- **7.2%** did not dispose of medications
- **2%** used all medication prior to expiration
- **1.4%** returned medications to the pharmacy



Boehringer, S. "What's the Best Way to Dispose of Medications?" (2004)

The new (2/21/07) federal prescription drug disposal guidelines advise Americans to:

- **Take unused, unneeded, or expired prescription drugs out of original containers and throw them in the trash**
  - Mix with an undesirable substance
  - Put in sturdy, opaque, non-descript containers
- **Flush prescription drugs down the toilet *only* if the label specifically instructs doing so.**
- **Dispose of unused prescription drugs through pharmaceutical take-back programs if available.**

The White House Office of National Drug Control Policy (ONDCP), Health and Human Services (HHS), U.S. EPA

The American Pharmacists Association and the U.S. Fish and Wildlife Service jointly recommend the following (2/14/07):

- **DO NOT FLUSH unused medications**
- **When tossing unused medications, protect children and pets from the potentially negative effects:**
  - crush or dissolve solid medications
  - mix with kitty litter or a solid kitchen substance
  - place in a sealed plastic bag to reduce the poisoning risk
  - remove and destroy **ALL** identifying personal information
  - check for approved state and local collection programs or with area hazardous waste facilities
- **Talk To Your Pharmacist**

Northern New England Poison Center

Issued a report that:

1) Assesses the pros & cons of different medicine disposal practices
2) Illustrates how government agencies and health organizations provide the public with conflicting unused medicine disposal advice

See (www.mainehealth.org/workfiles/mmc_services/Med_Disposal_Technical_Document_FINAL.pdf)

Northern New England Poison Center
Medicine Disposal Guidelines

Take your medicines to a medicine drop-off site. Contact your pharmacy or local police department to learn if this option exists nearby.

Other options include:

Garbage	Mix medicines in a plastic bag with used coffee grounds or kitty litter. Then put the tied plastic bag in your garbage.
Toilet	Flush medicines down the toilet.

Never throw medicine in its original container or loose in the garbage

Never burn your own medicines